* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1]
It comes to contain the light transmission layer in which at least one side was formed in the substrate made into the information recording surface, and said information recording surface by the shape of a disk type in which the feed hole was formed more thinly than said substrate, and the feed hole where a bore is bigger than the feed hole of said substrate was formed.
The optical recording medium characterized by things.
[Claim 2]
In claim 1,
While the annular projection which projects in the thickness direction was formed in the surroundings of the feed hole of said substrate, the feed hole where a bore is bigger than the outer diameter of this annular projection was formed in said light transmission layer.
The optical recording medium characterized by things.
[Claim 3]
In claim 2,
The amount of projection of said annular projection is almost equal to the thickness of said light transmission layer.
The optical recording medium characterized by things.
[Claim 4]
It comes to contain the forming cycle which fabricates the substrate of the shape of a disk type at least whose one side is an information recording surface, the light transmission layer formation process which forms a light transmission layer thinner than said substrate in said information recording surface, the slitting process which forms circular slitting in this light transmission layer, and the punching process which pierces some [at least] fields inside this slitting, pierces by the tool, and forms a feed hole in said light transmission layer and said substrate.
The manufacture approach of the optical recording medium characterized by things.
[Claim 5]
In claim 4,
Slitting of said light transmission layer is formed for a bigger diameter than the bore of the feed hole of said substrate, and the feed hole where a bore is bigger than the feed hole of said substrate is formed in said light transmission layer by piercing said light transmission layer and said substrate, pressurizing the field inside this slitting in the thickness direction by said punching tool, and dividing said light transmission layer in said slitting.
The manufacture approach of the optical recording medium characterized by things.
[Claim 6]
In claim 5,
While fabricating the circular projection of a bigger outer diameter than the bore of the feed hole of said substrate by said forming cycle to said information recording surface, forming said slitting in said light

transmission layer along the outside of the periphery of said circular projection and forming an annular projection in the surroundings of the feed hole of said substrate by leaving the periphery section of said circular projection by said punching tool, and piercing said substrate, the feed hole where a bore is bigger than the outer diameter of this annular projection is formed in said light transmission layer.
The manufacture approach of the optical recording medium characterized by things.
[Claim 7]
In either of claims 4-6,
Said light transmission layer is formed by rotating this substrate, while supplying the resin which has a fluidity near the core of said substrate with said light transmission layer formation process, making said resin flow on the direction outside of a path with a centrifugal force, and spreading.
The manufacture approach of the optical recording medium characterized by things.
[Claim 8]
In claim 7,
A radiation is irradiated so that said light transmission layer may be in a semi-hardening condition with said light transmission layer formation process by using construction material of said light transmission layer as radiation-curing nature resin,
The re-exposure process which re-irradiates a radiation after said slitting process at the light transmission layer of said semi-hardening condition, and is stiffened thoroughly was established.
The manufacture approach of the optical recording medium characterized by things.
[Claim 9]
It comes to contain a slitting means to form slitting circular in said light transmission layer of the semifinished product of the optical recording medium which comes to form a light transmission layer thinner than this substrate in said information recording surface in the substrate of the shape of a disk type at least whose one side is an information recording surface, and a punching means to pierce some [at least] fields inside said slitting, to pierce by the tool, and to form a feed hole in said light transmission layer and said substrate.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to the manufacture approach of an optical recording medium and an optical recording medium that the light transmission layer thinner than a substrate was formed in the information recording surface of a substrate, and the feed hole was formed, and a manufacturing installation.
[0002]
[Description of the Prior Art]
In recent years, optical recording media, such as CD (Compact Disc) and DVD (Digital Versatile Disc), have spread quickly as an information record medium. While DVD uses laser light with wavelength shorter than CD as an exposure light, it enables it to record and reproduce information mass by high density rather than CD by making numerical aperture of the lens of exposure light larger than CD, although an outer diameter is unified into 120mm and, as for the optical recording medium, thickness is generally unified into 1.2mm.
[0003]
On the other hand, since there is an inclination for comatic aberration to occur with the inclination (curvature) of a disk, and for informational record and exactness of reproduction to fall so that the wavelength of exposure light is short and the numerical aperture of a lens is large, DVD is setting thickness of a light transmission layer to 0.6mm of the one half of CD, secures the margin to the inclination (curvature) of a disk, and is maintaining informational record and exactness of reproduction.
[0004]
In addition, only in the 0.6mm light transmission layer, since rigidity and reinforcement are inadequate, it considers as the structure which DVD makes a 0.6mm substrate two sheets, makes an information recording surface inside, and was stuck, thickness is set to 1 or 2mm equal to CD, and rigidity equivalent to CD and reinforcement are secured.
[0005]
Moreover, generally a feed hole (for example, CD and DVD phi 15mm) is formed in an optical recording medium, and it is used for it for positioning in record, a regenerative apparatus, etc. Generally a feed hole is simultaneously fabricated by the forming cycle which fabricates a substrate in the shape of a disk type.
[0006]
Here, that record of still higher-density mass information should be realized, while making wavelength of exposure light brief further, there is a request of wanting to enlarge numerical aperture of a lens. The optical recording medium which made the light transmission layer much more thin is called for from this this request, and development of the optical recording medium which forms a light transmission layer thinner than a substrate in the information recording surface of the substrate as structure material, and sets total thickness to 1.2mm is furthered. In addition, the proposal which sets numerical aperture to 0.85

while using the laser light of the purple-blue color whose wavelength is 405nm as an exposure light that a specification should be unified, and sets thickness of a light transmission layer to 0.1mm corresponding to this is made.

[0007]

Drawing 18 is the perspective view showing the structure of an optical recording medium where such a thin light transmission layer was formed.

[0008]

An optical recording medium 100 is the one side type which can record information only on one side with the structure where the light transmission layer 104 thinner than a substrate 102 was formed in information recording surface 102A of a substrate 102.

[0009]

A substrate 102 is fabricated by injection molding with which the diameter generally excelled [mm / 1.1] in 120mm and thickness at mass production nature. It is injected between the molds of a couple, and is cooled and kept warm by predetermined temperature, and, specifically, resin, such as a polycarbonate, is fabricated in the shape of a disk type.

[0010]

As for the light transmission layer 104, thickness is formed in information recording surface 102A of a substrate 102 by a spin coat method etc. by 0.1mm. Specifically the resin of the light transmission nature of ultraviolet-rays hardenability or electron ray hardenability is supplied near the core of information recording surface 102A, a substrate 102 is rotated, and it spreads all over information recording surface 102A by making the supplied resin energize and flow on the direction outside of a path with a centrifugal force. Ultraviolet rays, an electron ray, etc. are irradiated after spreading, resin is stiffened, and a light transmission layer formation process is completed. In addition, in the double-sided type which can record information on both sides of a substrate, thickness of a substrate is set to 1.0mm, and it should just carry out the laminating of the 0.1mm light transmission layer to each of both sides of a substrate. Or thickness prepares two things which carried out the laminating of the light transmission layer which is 0.1mm, and may stick substrate sides on the substrate whose thickness is 0.5mm.

[0011]

[Problem(s) to be Solved by the Invention]

However, when a spin coat method is applied to the substrate with which the feed hole was formed, the thickness of the spread resin tends to become uneven and record of high-density information and playback may become difficult.

[0012]

Although the reason thickness becomes an ununiformity is not necessarily clear, it thinks in general as follows. It is spread to the whole substrate outside a supply location, a centrifugal force acting on resin promptly by revolution of a substrate, and flowing on the outside of the direction of a path rather than the supplied location, if resin is supplied to the perimeter of a feed hole. In order that a centrifugal force may always continue acting in the meantime, the thickness of the inside and an outside does not become homogeneity, but the inside is thin and serves as thickness distribution that an outside is thick. Moreover, although supplying resin additionally in order to compensate with thickness becoming thin is also considered, control of the high degree of accuracy according to dispersion in thickness is needed, and a actual top is difficult for such control.

[0013]

On the other hand, if it is a substrate without a feed hole, it can prevent that a centrifugal force acts on the resin which could supply resin inside the direction of a path rather than the case where the core of a substrate or a feed hole is, and supplied promptly. In this case, since the core of a substrate plays a role like a resin rich area ball and carries out additional supply of the resin continuously on an information recording surface, it is possible to spread resin by uniform thickness. In this case, since the spread resin is stiffened, as shown in drawing 19 , the light transmission layer 104 and a substrate 102 will be pierced, it will pierce by the tool 106, and a feed hole will be formed. In addition, sign 102A in drawing is the circular crevice fabricated to the field of information recording surface 102A of a substrate 102,

and an opposite hand, in order to make punching easy.
[0014]
However, since [whose thickness is about 0.1mm] it is a film very much, in case the light transmission layer 104 is pierced by the punching tool 106, it has the problem that weld flash may occur in the inner circumference section, or the inner circumference section may exfoliate from information recording surface 102A as shown in drawing 20 . Moreover, even if weld flash and exfoliation do not occur in a manufacture phase, when a finger etc. is inserted in a feed hole at the time of an activity, a finger etc. may touch the inner circumference section of a light transmission layer, and a light transmission layer may exfoliate.
[0015]
This invention makes it the technical problem to have been made in view of the above trouble, and to have been formed in the substrate by thickness with a uniform light transmission layer, and to provide the inner circumference section of a light transmission layer with the manufacture approach of weld flash, the optical recording medium which exfoliation cannot generate easily, and an optical recording medium, and a manufacturing installation.
[0016]
[Means for Solving the Problem]
In order to solve the above-mentioned technical problem, it found out that the light transmission layer which has a feed hole by forming circular slitting in a light transmission layer, piercing some [at least] fields inside this slitting, piercing by the tool, and forming a feed hole in a light transmission layer and a circular substrate could be certainly formed in a substrate by uniform thickness as a result of this invention person's inquiring wholeheartedly.
[0017]
That is, the above-mentioned technical problem is solvable with the following invention.
[0018]
(1) The optical recording medium characterized by coming to contain the light transmission layer in which at least one side was formed in the substrate made into the information recording surface, and said information recording surface by the shape of a disk type in which the feed hole was formed more thinly than said substrate, and the feed hole where a bore is bigger than the feed hole of said substrate was formed.
[0019]
(2) The optical recording medium of (1) characterized by forming in said light transmission layer the feed hole where a bore is bigger than the outer diameter of this annular projection while the annular projection which projects in the thickness direction was formed in the surroundings of the feed hole of said substrate.
[0020]
(3) (Two) optical recording media with which the amount of projection of said annular projection is characterized by being almost equal to the thickness of said light transmission layer.
[0021]
(4) The forming cycle which fabricates the substrate of the shape of a disk type at least whose one side is an information recording surface, The light transmission layer formation process which forms a light transmission layer thinner than said substrate in said information recording surface, The manufacture approach of the optical recording medium characterized by coming to contain the slitting process which forms circular slitting in this light transmission layer, and the punching process which pierces some [at least] fields inside this slitting, pierces by the tool, and forms a feed hole in said light transmission layer and said substrate.
[0022]
(5) The manufacture approach of the optical recording medium of (4) characterized by forming slitting of said light transmission layer for a bigger diameter than the bore of the feed hole of said substrate, and forming in said light transmission layer the feed hole where a bore is bigger than the feed hole of said substrate by piercing said light transmission layer and said substrate, pressurizing the field inside this

slitting in the thickness direction by said punching tool, and dividing said light transmission layer in said slitting.

[0023]

(6) Fabricate the circular projection of a bigger outer diameter than the bore of the feed hole of said substrate by said forming cycle to said information recording surface. Said slitting is formed in said light transmission layer along the outside of the periphery of said circular projection. The manufacture approach of the optical recording medium of (5) characterized by forming in said light transmission layer the feed hole where a bore is bigger than the outer diameter of this annular projection while forming an annular projection in the surroundings of the feed hole of said substrate by leaving the periphery section of said circular projection by said punching tool, and piercing said substrate.

[0024]

(7) The manufacture approach of one optical recording medium of (4) - (6) characterized by forming said light transmission layer by rotating this substrate while supplying the resin which has a fluidity near the core of said substrate with said light transmission layer formation process, making said resin flow on the direction outside of a path with a centrifugal force, and spreading.

[0025]

(8) The manufacture approach of the optical recording medium of (7) characterized by establishing the re-exposure process which irradiates a radiation so that said light transmission layer may be in a semi-hardening condition with said light transmission layer formation process by using construction material of said light transmission layer as radiation-curing nature resin, re-irradiates a radiation after said slitting process at the light transmission layer of said semi-hardening condition, and is stiffened thoroughly.

[0026]

(9) A shaping means to fabricate the substrate of the shape of a disk type at least whose one side is an information recording surface, The light transmission layer means forming which forms a light transmission layer thinner than this substrate in said information recording surface, The manufacturing installation of the optical recording medium characterized by coming to contain a slitting means to form circular slitting in this light transmission layer, and a punching means to pierce some [at least] fields inside said slitting, to pierce by the tool, and to form a feed hole in said light transmission layer and said substrate.

[0027]

(10) The optical recording medium of (2) characterized by the amount of projection of said annular projection being larger than the thickness of said light transmission layer.

[0028]

In addition, the bore of the feed hole of a light transmission layer and the outer diameter of the punching tool which pierces a light transmission layer are not necessarily in agreement. For example, when forming slitting of a bigger diameter than the bore of the feed hole of a substrate like the above (5), the punching tool of an outer diameter equal to the inside of the feed hole which it is going to form in a substrate is used. A light transmission layer is pressurized by the punching tool, is pierced, and is divided by slitting of the direction outside of a path rather than the periphery of a tool. Rather than slitting, rather than a punching tool, the direction inside part of a path is pierced also including the part of the direction outside of a path, is further extruded in the thickness direction by the tool, and is removed from an optical recording medium. That is, the feed hole of a light transmission layer is formed with a bigger bore than the outer diameter of a punching tool. On the other hand, if slitting is formed for a diameter equal to the bore of the feed hole of a substrate, it will pierce with the bore of the feed hole of a light transmission layer, and the outer diameter of a tool will be in agreement.

[0029]

Moreover, although the vocabulary a "radiation" means electromagnetic waves, such as the gamma ray and X-ray which are generally emit with breaking of a radioactive element, and alpha rays, and a corpuscular ray, suppose that the vocabulary a "radiation" is use in a meaning call the generic name of the electromagnetic wave which has the property to stiffen the specific resin of a floating condition and corpuscular rays, such as ultraviolet rays and an electron ray, in this description.

[0030]
[Embodiment of the Invention]
Hereafter, the operation gestalt of this invention is explained to a detail with reference to a drawing.
[0031]
Drawing 1 is the sectional view of the optical recording medium 10 concerning this operation gestalt. Drawing 2 is the sectional view showing the punching process at the time of manufacture of an optical recording medium 10.
[0032]
The forming cycle by which the manufacture approach of an optical recording medium 10 fabricates the substrate 12 of the shape of a disk type whose one side is information recording surface 12A, The light transmission layer formation process which forms the light transmission layer 14 thinner than a substrate 12 in information recording surface 12A, It is characterized by coming to contain the slitting process which forms the circular slitting 16 in the light transmission layer 14, and the punching process which pierces the field inside slitting 16, pierces by the tool 18, and forms feed-hole 14A and a feed hole 20 in the light transmission layer 14 and a substrate 12.
[0033]
About other processes, since it is the same as that of the manufacture approach of the conventional optical recording medium, explanation is omitted suitably.
[0034]
First, the forming cycle of a substrate 12 is explained.
[0035]
Resin, such as a polycarbonate which heated beforehand and was fused between the molds (graphic display abbreviation) of a couple, is injected, and it fabricates in the shape of [it is cooled and kept warm, and a diameter does not have 120mm in information recording surface 12A, and a feed hole does not have / in the shape of / thickness in a predetermined molding temperature at 1.1mm] a disk type. Under the present circumstances, detailed predetermined irregularity etc. is formed in information recording surface 12A by La Stampa (graphic display abbreviation) (refer to drawing 3). (graphic display abbreviation) It may replace with a polycarbonate and resin, such as an acrylic and epoxy, may be used. In addition, sign 12B in drawing is the circular crevice fabricated to the field of information recording surface 12A and an opposite hand, in order to make a substrate 12 easy to pierce at the punching process mentioned later, and the bore is fabricated equally to the bore of a feed hole (it forms behind) 20. Thus, a substrate 12 is fabricated, and it removes from a mold, and cools in ordinary temperature, and the stratum functionale is formed in information recording surface 12A at degree process.
[0036]
Here, the formation process of the stratum functionale is explained briefly. In addition, since the stratum functionale is not considered to be the need rather than the light transmission layer 14 especially for grasp of this invention while it is a film further, the graphic display of the stratum functionale is omitted. When an optical recording medium 10 is a type only for playbacks, a reflecting layer is formed in information recording surface 12A as stratum functionale. On the other hand, when optical recording media 10 are record and a refreshable type about information, a reflecting layer and a record layer are formed in information recording surface 12A in this order as stratum functionale. A reflecting layer consists of aluminum, Ag, Au, etc., and is formed with the sputtering method, vacuum deposition, etc. A record layer consists of a phase change ingredient, a coloring matter ingredient, an optical magnetic adjuster, etc., and is formed with the sputtering method, a spin coat method, the ripping method, vacuum deposition, etc.
[0037]
Next, a light transmission layer formation process is explained.
[0038]
The light transmission layer 14 is formed on the stratum functionale with a spin coat method.
[0039]

First, a substrate 12 is arranged horizontally, revolution actuation is carried out, and as shown in drawing 4 , specified quantity supply of the resin 21 of ultraviolet-rays hardenability is carried out from the upper part in the core of a substrate 12. The centrifugal force which is proportional to distance from the core of a substrate 12 acts on resin 21, and thereby, resin 21 is energized by the direction outside of a path, and is spread by the whole information recording surface 12A. Under the present circumstances, in order that a centrifugal force may hardly act on the resin 21 near the core, the core of a substrate 12 plays a role like ********, and carries out additional supply of the resin 21 continuously on information recording surface 12A. Thereby, as shown in the whole information recording surface 12A at drawing 5 , resin 21 is spread by uniform thickness. A light transmission layer formation process is completed by irradiating resin 21 and making it harden ultraviolet rays after spreading.

[0040]

Next, a slitting process is explained.

[0041]

First, cutting part 22A of a tool 22 is made to contact the position of the light transmission layer 14, as shown in drawing 6 . Cutting part 22A is made to specifically contact the location corresponding to the inner circumference of the feed hole 20 formed behind. If the light transmission layer 14 is rotated with a substrate 12 in this condition as shown in drawing 7 , the circular slitting 16 will be formed in the light transmission layer 14 in the shape of a said alignment. The depth of slitting 16 may be made shallower than the thickness of the light transmission layer 14, and may be made equal to the thickness of the light transmission layer 14. Moreover, it is made deeper than the thickness of the light transmission layer 14, and you may make it even a substrate 12 cut deeply.

[0042]

Next, a punching process is explained.

[0043]

First, the circular punching tool 18 of an outer diameter equal to the bore of the feed hole 20 which it is going to form is prepared, as shown in drawing 2 , it pierces, it pierces so that the periphery of a tool 18 may cut deeply and it may be in agreement with 16, and a tool 18 is made to counter the light transmission layer 14 in the shape of a said alignment. Next, the punching tool 18 is energized in the direction of this light transmission layer 14, and as the light transmission layer 14 and a substrate 12 are pierced, it pierces by the tool 18 and it is shown in drawing 1 , while forming feed-hole 14A in the light transmission layer 14, a feed hole 20 is formed in a substrate 12. In addition, feed-hole 14A and a feed hole 20 have an equal bore.

[0044]

Under the present circumstances, since it pierces in a light transmission layer, cut in it deeply in advance of a process, and slitting by the process is formed in it, and stress concentrates on the part of the slitting 16 of the light transmission layer 14, the light transmission layer 14 is cut deeply and it is divided into accuracy in the part of 16, weld flash does not occur in the inner circumference section of the light transmission layer 14, or the inner circumference section does not exfoliate from information recording surface 12A.

[0045]

An optical recording medium 10 is completed by the above. Since an optical recording medium 10 has the uniform thickness of the light transmission layer 14, while being able to record high-density information on accuracy and being able to reproduce, the inner circumference section sticks to information recording surface 12A certainly, and cannot exfoliate easily, and it is reliable.

[0046]

In addition, although feed-hole 14A of the feed hole 20 of a substrate 12 and the light transmission layer 14 is circular and it is formed in the optical recording medium 10 in the shape of a said alignment, naturally the eccentricity of the some from this circular and strict cardiac condition from which it separated a little from the strict perfect circle configuration is permitted that the precision of the perfect circle of feed holes 20 and 14A and the precision of this alignment should just be in the dimensional tolerance required of an optical recording medium.

[0047]
Next, the 2nd operation gestalt of this invention is explained.
[0048]
Drawing 8 is the sectional view showing the structure of the optical recording medium 30 concerning a **** 2 operation gestalt.
[0049]
The optical recording medium 30 is characterized by forming feed-hole 14A with a bigger bore than the feed hole 20 of a substrate 12 in the light transmission layer 14.
[0050]
Moreover, the manufacture approach of an optical recording medium 30 forms the slitting 16 of the light transmission layer 14 for a bigger diameter than the bore of the feed hole 20 of a substrate 12, as shown in drawing 9 . Pierce the field inside slitting 16, pressurize in the thickness direction by the tool 18, cut the light transmission layer 14 deeply, and it sets to 16. It is characterized by forming feed-hole 14A with a bigger bore than the feed hole 20 of a substrate 12 in the light transmission layer 14 by piercing the light transmission layer 14 and a substrate 12, dividing.
[0051]
About other points, since it is the same as that of the manufacture approach of said optical recording medium 10 and an optical recording medium 10, explanation is omitted suitably.
[0052]
First, a slitting process is explained.
[0053]
As shown in drawing 10 , rather than the location corresponding to the inner circumference of the feed hole 20 behind formed in a substrate 12, cutting part 22A of a tool 22 is made to contact the light transmission layer 14 a little in the location of the outside of the direction of a path, and the light transmission layer 14 is rotated with a substrate 12 in this condition. Thereby, the circular slitting 16 is formed in the light transmission layer 14 in the shape of a said alignment for a bigger diameter a little than the bore of the feed hole 20 behind formed in a substrate 12.
[0054]
Next, a punching process is explained.
[0055]
It pierces so that it may be in agreement with the inner circumference of the feed hole 20 which the periphery of the punching tool 18 tends to form in a substrate 12 first, and a tool 18 is made to counter the light transmission layer 14, as shown in drawing 9 . Next, the punching tool 18 is energized in the direction of the light transmission layer 14, and the feed hole 20 as pierced the light transmission layer 14 and a substrate 12, pierced by the tool 18 and shown in drawing 8 is formed in a substrate 12.
[0056]
Under the present circumstances, the punching tool 18 pressurizes the field inside the slitting 16 in the light transmission layer 14 at a substrate 12 side, cuts the light transmission layer 14 deeply, divides it in 16, and to a substrate 12 side, as it extrudes the inside part of slitting 16, it pierces it.
[0057]
In addition, although the diameter of the slitting 16 in the light transmission layer 14 is larger than the bore of the feed hole 20 of a substrate 12, it cuts deeply, and the inside part of 16 being extruded in the thickness direction by the punching tool 18, and forming the feed hole 20 of a substrate 12, this feed hole 20 is inserted in and it is removed. Moreover, crevice (roll off) 18A to which it can pierce to the cutting part peripheral face of a punching tool inside slitting, and the light transmission layer outside a tool (the shape of a ring) can enter into it is prepared, and you may enable it to remove the light transmission layer of the part concerned efficiently.
[0058]
Thereby, feed-hole 14A with a larger bore than the feed hole 20 of a substrate 12 is formed in the light transmission layer 14.
[0059]

In addition, since it pierces in a light transmission layer, cut in it deeply in advance of a process, and slitting by the process is formed in it also in this case, and stress concentrates on the part of the slitting 16 of the light transmission layer 14, the light transmission layer 14 is cut deeply and it is divided into accuracy in the part of 16, weld flash does not occur in the inner circumference section of the light transmission layer 14, or the inner circumference section does not exfoliate from information recording surface 12A.

[0060]

Thus, by making feed-hole 14A of the light transmission layer 14 larger than the feed hole 20 of a substrate 12, even if it inserts a finger in a feed hole 20, it is hard coming to touch the inner circumference section of the light transmission layer 14 directly a finger, and exfoliation of the light transmission layer 14 by human handling can also be prevented.

[0061]

Similarly, when loading an information recording device, an information regenerative apparatus, etc. with an optical recording medium 30, exfoliation of the light transmission layer 14 at the time of the components for positioning etc. not contacting the inner circumference section of the light transmission layer 14, and using it with these equipments can also be prevented.

[0062]

Moreover, although there is a difference in the bore of the feed hole 20 of a substrate 12, and the bore of feed-hole 14A of the light transmission layer 14, two feed holes 20 and 14A can be formed by 1 time of punching by the punching tool 18 by forming slitting 16, and productive efficiency is good.

[0063]

In addition, naturally the eccentricity of the some from this circular and strict cardiac condition from which it separated a little from the strict perfect circle is permitted like said 1st operation gestalt that the precision of the perfect circle of the feed hole 20 of a substrate 12 and the precision of this alignment over an optical recording medium 30 should just be in the dimensional tolerance required of an optical recording medium 30.

[0064]

Moreover, that feed-hole 14A of the light transmission layer 14 should just be formed so that inner circumference may be located in the direction outside of a path rather than the feed hole 20 of a substrate 12, the precision of a perfect circle required of feed-hole 14A of the light transmission layer 14 and the precision of this alignment over an optical recording medium 30 need to be lower than the precision required of the feed hole 20 of a substrate 12, and do not necessarily need to be the feed hole 20 and this alignment of a substrate 12. That is, the precision required of formation of slitting 16 is low, and a slitting activity is so easy. Moreover, it is necessary to pierce in the case of punching and to cut deeply with a tool 18 that the punching tool 18 is deeply cut so that it may be in agreement with the feed hole 20 which it is going to form in a substrate 12, and it should just pierce the field inside 16, and 16 does not necessarily need to be in this cardiac condition.

[0065]

Next, the 3rd operation gestalt of this invention is explained.

[0066]

Drawing 11 is the sectional view showing the structure of the optical recording medium 40 concerning a **** 3 operation gestalt.

[0067]

The optical recording medium 40 is characterized by forming feed-hole 44A with a bigger bore than the outer diameter of the annular projection 48 in the light transmission layer 44 while the annular projection 48 which projects in the thickness direction is formed in the surroundings of the feed hole 50 of a substrate 42.

[0068]

As shown in drawing 12 , moreover, the manufacture approach of an optical recording medium 40 The circular projection 43 of a bigger outer diameter than the bore of the feed hole 50 of the substrate 42 behind formed by the forming cycle is fabricated to information recording surface 42A. Cut deeply in

the light transmission layer 44 along the outside of the periphery of the circular projection 43, and 46 is formed. While forming the annular projection 48 in a substrate 42 around a feed hole 50 and a feed hole 50 by leaving the periphery section of the circular projection 43 by the punching tool 18, and piercing a substrate 42, it is characterized by forming feed-hole 44A with a bigger bore than the outer diameter of this annular projection 48 in the light transmission layer 44.

[0069]

About other points, since it is the same as that of the manufacture approach of said optical recording media 10 and 30 and these optical recording media, explanation is omitted suitably.

[0070]

First, the forming cycle of a substrate 42 is explained.

[0071]

The circular projection 43 as shown in the information recording surface 42A side of a substrate 42 at drawing 13 is formed by establishing the circular crevice in the core of the mold which fabricates information recording surface 42A among the molds (graphic display abbreviation) of the couple which fabricates a substrate 42. The circular projection 43 is fabricated in the shape of a said alignment so that it may become a big outer diameter a little from the bore of the feed hole 50 formed behind. In addition, the thickness of parts other than circular projection 43 fabricates a substrate 42 so that 1.1mm and the amount of projection of the circular projection 43 may be set to 0.1mm. Moreover, the circular projection is prepared in the core of the mold which fabricates the field of information recording surface 42A of a substrate 42, and an opposite hand, and information recording surface 42A of a substrate 42 and crevice 42B circular to an opposite hand are fabricated in the shape of a said alignment. In addition, circular crevice 42B is fabricated so that a bore may become equal to the bore of the feed hole 50 formed behind.

[0072]

Next, the formation process of the light transmission layer 44 is explained.

[0073]

First, a substrate 42 is arranged horizontally, revolution actuation is carried out, and specified quantity supply of the ultraviolet-rays hardenability resin is carried out from the upper part in the core of this substrate 42. The centrifugal force which is proportional to distance from the core of a substrate 42 acts on the supplied resin, and it is energized by the direction outside of a path, and is spread by the whole information recording surface 42A. Under the present circumstances, in order that a centrifugal force may hardly act on the resin near the center of rotation, the core of a substrate 42 plays a role like ********, and carries out additional supply of the resin continuously on information recording surface 42A. Thereby, as shown in drawing 14 , resin is spread by the whole information recording surface 42A by uniform thickness. In addition, since resin is spread by uniform thickness also on the circular projection 43, the light transmission layer 44 is formed a ** with a stage. After spreading, irradiate resin, it is made to harden ultraviolet rays and the formation process of the light transmission layer 44 is completed.

[0074]

Next, a slitting process is explained.

[0075]

As shown in drawing 15 , slitting 46 is formed near the level difference part of the light transmission layer 44 so that the outside of the periphery of the circular projection 43 may be met. In addition, since it is the same as said 1st and 2nd operation gestalt about the tool which forms slitting 46, explanation is omitted.

[0076]

Next, a punching process is explained.

[0077]

First, it pierces so that it may be in agreement with the inner circumference of the feed hole 50 which the periphery of the punching tool 18 tends to form, and a tool 18 is made to counter the light transmission layer 44, as shown in drawing 12 . Next, the punching tool 18 is energized in the direction of the light

transmission layer 44, it leaves the periphery section and the circular projection 43 is pierced, while forming the feed hole 50 as shown in drawing 11 , it leaves a part of circular projection 43, and the annular projection 48 is formed in the surroundings of a feed hole 50.

[0078]

Under the present circumstances, the punching tool 18 pressurizes in the thickness direction, cuts the light transmission layer 44 on the circular projection 43 deeply, divides it in 46, and it is pierced so that the inside part of slitting 46 may be extruded to a substrate 42 side. Thereby, feed-hole 44A with a bigger bore than the outer diameter of the annular projection 48 is formed in the light transmission layer 44.

[0079]

Since it pierces in a light transmission layer, cut in it deeply in advance of a process, and slitting by the process is formed in it also in this case, and stress concentrates on the part of the slitting 46 of the light transmission layer 44, the light transmission layer 44 is cut deeply and it is divided into accuracy in the part of 46, weld flash does not occur in the inner circumference section of the light transmission layer 44, or the inner circumference section does not exfoliate from information recording surface 42A.

[0080]

That is, like said optical recording media 10 and 30, the thickness of the light transmission layer 44 is uniform, the inner circumference section of the light transmission layer 44 sticks to information recording surface 42A certainly, and cannot exfoliate easily, and an optical recording medium 40 is reliable while it can record and reproduce information at accuracy.

[0081]

Furthermore, since the annular projection 48 is formed inside the inner circumference section of the light transmission layer 44, even if it inserts a finger in a feed hole 50, a finger cannot touch the inner circumference section of the light transmission layer 44 directly, and exfoliation of the light transmission layer 44 by human handling can also be prevented certainly.

[0082]

Similarly, when loading an information recording device, an information regenerative apparatus, etc. with an optical recording medium 40, exfoliation of the light transmission layer 44 at the time of the components for positioning etc. not contacting the inner circumference section of the light transmission layer 44, and using it with these equipments etc. can also be prevented certainly.

[0083]

That is, since the inner circumference section of the light transmission layer 44 is protected by the annular projection 48, exfoliation of the light transmission layer 44 can be prevented certainly.

[0084]

Moreover, although there is a difference in the bore of the feed hole 50 of a substrate 42, and the bore of feed-hole 44A of the light transmission layer 44, two feed holes 50 and 44A and the annular projection 48 can be formed by 1 time of punching by the punching tool 18 by forming slitting 46, and productive efficiency is good.

[0085]

In addition, the annular projection 48 does not necessarily need to have [that what is necessary is just to project in the thickness direction around the feed hole 50 of a substrate 42] the fixed width of face of the direction of a path. That is, the periphery of the annular projection 48 does not need to be the round shape of an optical recording medium 40 and this alignment. Therefore, in the forming cycle of a substrate 42, eccentricity of the circular projection 43 may be carried out a little, and you may form.

[0086]

Moreover, feed-hole 44A of the light transmission layer 44 does not need to be the round shape of an optical recording medium 40 and this alignment that what is necessary is to just be formed so that inner circumference may be located in the direction outside of a path rather than the annular projection 48. Therefore, slitting which was cut deeply and carried out eccentricity to the light transmission layer 44 a little also at the process may be formed.

[0087]

Moreover, in said the 1st - 3rd operation gestalt, although the optical recording medium is considered as the one side type which can record information only on one side, this invention is not limited to this and, naturally this invention can be applied also to the optical recording medium of the double-sided type which can record information on both sides. In this case, thickness can consider as the optical recording medium which is 1.2mm by setting thickness of a substrate to 1.0mm and carrying out the laminating of the 0.1mm light transmission layer to both sides of a substrate. Or thickness prepares two things which carried out the laminating of the light transmission layer which is 0.1mm, and may stick substrate sides on the substrate whose thickness is 0.5mm. Furthermore, two or more record layers can apply this invention also to the optical recording medium formed in one side or both sides.

[0088]

Moreover, although it cuts deeply in the light transmission layers 14 and 44 and 16 and 46 are formed after irradiating ultraviolet rays to the resin spread with the formation process of the light transmission layers 14 and 44 in said the 1st - 3rd operation gestalt and making it harden thoroughly This invention makes the spread resin a semi-hardening condition, and after it forms slitting 16 and 46, you may make it stiffen thoroughly the resin which re-irradiated ultraviolet rays and spread them by not being limited to to this and controlling the irradiation time of ultraviolet rays etc. by the formation process of the light transmission layers 14 and 44 suitably.

[0089]

When making a cutting edge contact the light transmission layers 14 and 44, cutting deeply and forming 16 and 46, although it can extend a little in the thickness direction of a cutting edge, if the light transmission layers 14 and 44 are in a semi-hardening condition, easily, it can follow, and the light transmission layers 14 and 44 can deform in the thickness direction of a cutting edge, and can prevent the exfoliation from substrates 12 and 42 certainly.

[0090]

As for the degree of the semi-hardening of the spread resin, it is desirable that it is the hardness which is extent with which resin does not adhere to a cutting edge, and is the softness which is extent which slitting of a cutting edge is followed, and resin follows and deforms in the thickness direction of a cutting edge easily, and does not exfoliate from an interface with a substrate.

[0091]

In addition, in order to pierce certainly the inside part of slitting in a light transmission layer and to remove it, it is desirable to pierce and to stiffen a light transmission layer thoroughly before a process.

[0092]

Moreover, in said the 1st - 3rd operation gestalt, although a light transmission layer is resin of ultraviolet-rays hardenability, it may use the resin of the property hardened with the radiation of other classes, such as resin of electron ray hardenability.

[0093]

Moreover, in said the 1st - 3rd operation gestalt, although the light transmission layer is formed in a substrate with the spin coat method, this invention is not limited to this and may form a light transmission layer in a substrate by sticking the sheet-like ingredient of light transmission nature on a substrate for example. Furthermore, a light transmission layer may be formed in a substrate by other approaches, such as a doctor blade method.

[0094]

Moreover, in said the 1st - 3rd operation gestalt, slitting may be formed in a light transmission layer by making a tool contact a light transmission layer, not limiting this invention to this, fixing a substrate and a light transmission layer, and moving a tool in a circular orbit, although slitting is formed by rotating a light transmission layer with a substrate. Moreover, it may replace with a tool and slitting may be formed using a laser beam. Moreover, as shown, for example in drawing 16 , the pressure welding of the edge of the cylindrical tool 60 may be carried out to a light transmission layer, and slitting 16 (46) may be formed.

[0095]

Moreover, although an optical recording medium is pierced, it pierces from a light transmission layer

side to a substrate side by the tool in a punching process in said the 1st - 3rd operation gestalt and the feed hole is formed This invention is not what is limited to this. When the depth of slitting is enough etc., When the force of a direction of exfoliating from the information recording surface which acts on a light transmission layer by punching is small, as shown in drawing 17 , an optical recording medium may be pierced from a substrate 12 (42) side to the light transmission layer 14 (44) side, it may pierce by the tool, and a feed hole may be formed. When the force of a direction of on the other hand exfoliating from the information recording surface which acts on a light transmission layer by punching when slitting is shallow is large, it is desirable to pierce an optical recording medium from a light transmission layer side to a substrate side, to pierce by the tool like said the 1st - 3rd operation gestalt, and to form a feed hole.

[0096]

Moreover, although the circular crevices 12B and 42B are fabricated by the forming cycle, substrates 12 and 42 are not limited to this, and this invention fabricates a substrate in the shape of [without a circular crevice] a disk type, and you may make it pierce it in said the 1st - 3rd operation gestalt, when punching of substrates 12 and 42 is easy.

[0097]

Moreover, in said 3rd operation gestalt, although the amount of projection of the annular projection 48 is 0.1mm equal to the thickness of the light transmission layer 44, this invention is not limited to this and may make the amount of projection of the annular projection 44 larger than the thickness of the light transmission layer 44. By doing in this way, when it is [optical recording medium / 40] sufficient in two or more [-fold] and lays an optical recording medium 40 in base superiors, the light transmission layer 44 can prevent contacting other optical recording media, a base, etc., and can protect the light transmission layer 44. In addition, although the light transmission layer 44 can contact other optical recording media etc. if an optical recording medium 40 inclines a little, contact pressure can be mitigated also in this case and the fixed effectiveness of protecting the light transmission layer 44 can be expected.

[0098]

In addition, also when the amount of projection of the annular projection 44 is smaller than the thickness of the light transmission layer 44, the fixed effectiveness that the annular projection 44 protects the inner circumference section of the light transmission layer 44 from a finger, positioning components, etc. is acquired.

[0099]

[Effect of the Invention]

The outstanding effectiveness of becoming possible to form a feed hole and to form a light transmission layer in a substrate by uniform thickness is brought about without making the inner circumference section of a light transmission layer generate weld flash and exfoliation, as explained above according to this invention.

[Brief Description of the Drawings]

[Drawing 1] The sectional view showing the structure of the optical recording medium concerning the 1st operation gestalt of this invention

[Drawing 2] The sectional view showing the punching process of this optical recording medium

[Drawing 3] The sectional view showing the forming cycle of the substrate of this optical recording medium

[Drawing 4] The sectional view showing spreading of the resin in the formation process of the optical recording layer of this optical recording medium

[Drawing 5] The sectional view showing the optical recording layer formed of the homeoplasia process

[Drawing 6] The sectional view showing the slitting process of this optical recording medium

[Drawing 7] This perspective view

[Drawing 8] The sectional view showing the structure of the optical recording medium concerning the 2nd operation gestalt of this invention

[Drawing 9] The sectional view showing the punching process of this optical recording medium

[Drawing 10] The sectional view showing the slitting process of this optical recording medium
[Drawing 11] The sectional view showing the structure of the optical recording medium concerning the 3rd operation gestalt of this invention
[Drawing 12] The sectional view showing the punching process of this optical recording medium
[Drawing 13] The sectional view showing the forming cycle of the substrate of this optical recording medium
[Drawing 14] The sectional view showing the formation process of the optical recording layer of this optical recording medium
[Drawing 15] The sectional view showing the slitting process of this optical recording medium
[Drawing 16] The sectional view showing the slitting process concerning other operation gestalten of this invention
[Drawing 17] The sectional view showing the punching process concerning other operation gestalten of this invention
[Drawing 18] The perspective view showing the structure of the conventional optical recording medium
[Drawing 19] The sectional view showing the punching process of this optical recording medium
[Drawing 20] The sectional view showing the weld flash of the inner circumference section of the light transmission layer by this punching process
[Description of Notations]
10, 30, 40,100 -- Optical recording medium
12 42,102 -- Substrate
12A, 42A, 102A -- Information recording surface
14 44,104 -- Light transmission layer
16 46 -- Slitting
18 -- Punching tool
14A, 20, 44A, 50 -- Feed hole
43 -- Circular projection
48 -- Annular projection

[Translation done.]

* NOTICES *

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TECHNICAL FIELD

[Field of the Invention]
This invention relates to the manufacture approach of an optical recording medium and an optical recording medium that the light transmission layer thinner than a substrate was formed in the information recording surface of a substrate, and the feed hole was formed, and a manufacturing installation.
[0002]

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EFFECT OF THE INVENTION

[Effect of the Invention]
The outstanding effectiveness of becoming possible to form a feed hole and to form a light transmission layer in a substrate by uniform thickness is brought about without making the inner circumference section of a light transmission layer generate weld flash and exfoliation, as explained above according to this invention.

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PRIOR ART

[Description of the Prior Art]
In recent years, optical recording media, such as CD (Compact Disc) and DVD (Digital Versatile Disc), have spread quickly as an information record medium. While DVD uses laser light with wavelength shorter than CD as an exposure light, it enables it to record and reproduce information mass by high density rather than CD by making numerical aperture of the lens of exposure light larger than CD, although an outer diameter is unified into 120mm and, as for the optical recording medium, thickness is generally unified into 1.2mm.
[0003]
On the other hand, since there is an inclination for comatic aberration to occur with the inclination (curvature) of a disk, and for informational record and exactness of reproduction to fall so that the wavelength of exposure light is short and the numerical aperture of a lens is large, DVD is setting thickness of a light transmission layer to 0.6mm of the one half of CD, secures the margin to the inclination (curvature) of a disk, and is maintaining informational record and exactness of reproduction.
[0004]
In addition, only in the 0.6mm light transmission layer, since rigidity and reinforcement are inadequate, it considers as the structure which DVD makes a 0.6mm substrate two sheets, makes an information recording surface inside, and was stuck, thickness is set to 1 or 2mm equal to CD, and rigidity equivalent to CD and reinforcement are secured.
[0005]
Moreover, generally a feed hole (for example, CD and DVD phi 15mm) is formed in an optical recording medium, and it is used for it for positioning in record, a regenerative apparatus, etc. Generally a feed hole is simultaneously fabricated by the forming cycle which fabricates a substrate in the shape of a disk type.
[0006]
Here, that record of still higher-density mass information should be realized, while making wavelength of exposure light brief further, there is a request of wanting to enlarge numerical aperture of a lens. The optical recording medium which made the light transmission layer much more thin is called for from this this request, and development of the optical recording medium which forms a light transmission layer thinner than a substrate in the information recording surface of the substrate as structure material, and sets total thickness to 1.2mm is furthered. In addition, the proposal which sets numerical aperture to 0.85 while using the laser light of the purple-blue color whose wavelength is 405nm as an exposure light that a specification should be unified, and sets thickness of a light transmission layer to 0.1mm corresponding to this is made.
[0007]
Drawing 18 is the perspective view showing the structure of an optical recording medium where such a thin light transmission layer was formed.
[0008]
An optical recording medium 100 is the one side type which can record information only on one side

with the structure where the light transmission layer 104 thinner than a substrate 102 was formed in information recording surface 102A of a substrate 102.
[0009]
A substrate 102 is fabricated by injection molding with which the diameter generally excelled [mm / 1.1] in 120mm and thickness at mass production nature. It is injected between the molds of a couple, and is cooled and kept warm by predetermined temperature, and, specifically, resin, such as a polycarbonate, is fabricated in the shape of a disk type.
[0010]
As for the light transmission layer 104, thickness is formed in information recording surface 102A of a substrate 102 by a spin coat method etc. by 0.1mm. Specifically the resin of the light transmission nature of ultraviolet-rays hardenability or electron ray hardenability is supplied near the core of information recording surface 102A, a substrate 102 is rotated, and it spreads all over information recording surface 102A by making the supplied resin energize and flow on the direction outside of a path with a centrifugal force. Ultraviolet rays, an electron ray, etc. are irradiated after spreading, resin is stiffened, and a light transmission layer formation process is completed. In addition, in the double-sided type which can record information on both sides of a substrate, thickness of a substrate is set to 1.0mm, and it should just carry out the laminating of the 0.1mm light transmission layer to each of both sides of a substrate. Or thickness prepares two things which carried out the laminating of the light transmission layer which is 0.1mm, and may stick substrate sides on the substrate whose thickness is 0.5mm.
[0011]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]
However, when a spin coat method is applied to the substrate with which the feed hole was formed, the thickness of the spread resin tends to become uneven and record of high-density information and playback may become difficult.
[0012]
Although the reason thickness becomes an ununiformity is not necessarily clear, it thinks in general as follows. It is spread to the whole substrate outside a supply location, a centrifugal force acting on resin promptly by revolution of a substrate, and flowing on the outside of the direction of a path rather than the supplied location, if resin is supplied to the perimeter of a feed hole. In order that a centrifugal force may always continue acting in the meantime, the thickness of the inside and an outside does not become homogeneity, but the inside is thin and serves as thickness distribution that an outside is thick. Moreover, although supplying resin additionally in order to compensate with thickness becoming thin is also considered, control of the high degree of accuracy according to dispersion in thickness is needed, and a actual top is difficult for such control.
[0013]
On the other hand, if it is a substrate without a feed hole, it can prevent that a centrifugal force acts on the resin which could supply resin inside the direction of a path rather than the case where the core of a substrate or a feed hole is, and supplied promptly. In this case, since the core of a substrate plays a role like a resin rich area ball and carries out additional supply of the resin continuously on an information recording surface, it is possible to spread resin by uniform thickness. In this case, since the spread resin is stiffened, as shown in drawing 19 , the light transmission layer 104 and a substrate 102 will be pierced, it will pierce by the tool 106, and a feed hole will be formed. In addition, sign 102A in drawing is the circular crevice fabricated to the field of information recording surface 102A of a substrate 102, and an opposite hand, in order to make punching easy.
[0014]
However, since [whose thickness is about 0.1mm] it is a film very much, in case the light transmission layer 104 is pierced by the punching tool 106, it has the problem that weld flash may occur in the inner circumference section, or the inner circumference section may exfoliate from information recording surface 102A as shown in drawing 20 . Moreover, even if weld flash and exfoliation do not occur in a manufacture phase, when a finger etc. is inserted in a feed hole at the time of an activity, a finger etc. may touch the inner circumference section of a light transmission layer, and a light transmission layer may exfoliate.
[0015]
This invention makes it the technical problem to have been made in view of the above trouble, and to have been formed in the substrate by thickness with a uniform light transmission layer, and to provide the inner circumference section of a light transmission layer with the manufacture approach of weld flash, the optical recording medium which exfoliation cannot generate easily, and an optical recording medium, and a manufacturing installation.

[0016]

[Translation done.]

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MEANS

[Means for Solving the Problem]
In order to solve the above-mentioned technical problem, it found out that the light transmission layer which has a feed hole by forming circular slitting in a light transmission layer, piercing some [at least] fields inside this slitting, piercing by the tool, and forming a feed hole in a light transmission layer and a circular substrate could be certainly formed in a substrate by uniform thickness as a result of this invention person's inquiring wholeheartedly.
[0017]
That is, the above-mentioned technical problem is solvable with the following invention.
[0018]
(1) The optical recording medium characterized by coming to contain the light transmission layer in which at least one side was formed in the substrate made into the information recording surface, and said information recording surface by the shape of a disk type in which the feed hole was formed more thinly than said substrate, and the feed hole where a bore is bigger than the feed hole of said substrate was formed.
[0019]
(2) The optical recording medium of (1) characterized by forming in said light transmission layer the feed hole where a bore is bigger than the outer diameter of this annular projection while the annular projection which projects in the thickness direction was formed in the surroundings of the feed hole of said substrate.
[0020]
(3) (Two) optical recording media with which the amount of projection of said annular projection is characterized by being almost equal to the thickness of said light transmission layer.
[0021]
(4) The forming cycle which fabricates the substrate of the shape of a disk type at least whose one side is an information recording surface, The light transmission layer formation process which forms a light transmission layer thinner than said substrate in said information recording surface, The manufacture approach of the optical recording medium characterized by coming to contain the slitting process which forms circular slitting in this light transmission layer, and the punching process which pierces some [at least] fields inside this slitting, pierces by the tool, and forms a feed hole in said light transmission layer and said substrate.
[0022]
(5) The manufacture approach of the optical recording medium of (4) characterized by forming slitting of said light transmission layer for a bigger diameter than the bore of the feed hole of said substrate, and forming in said light transmission layer the feed hole where a bore is bigger than the feed hole of said substrate by piercing said light transmission layer and said substrate, pressurizing the field inside this slitting in the thickness direction by said punching tool, and dividing said light transmission layer in said slitting.
[0023]

(6) Fabricate the circular projection of a bigger outer diameter than the bore of the feed hole of said substrate by said forming cycle to said information recording surface. Said slitting is formed in said light transmission layer along the outside of the periphery of said circular projection. The manufacture approach of the optical recording medium of (5) characterized by forming in said light transmission layer the feed hole where a bore is bigger than the outer diameter of this annular projection while forming an annular projection in the surroundings of the feed hole of said substrate by leaving the periphery section of said circular projection by said punching tool, and piercing said substrate.
[0024]
(7) The manufacture approach of one optical recording medium of (4) - (6) characterized by forming said light transmission layer by rotating this substrate while supplying the resin which has a fluidity near the core of said substrate with said light transmission layer formation process, making said resin flow on the direction outside of a path with a centrifugal force, and spreading.
[0025]
(8) The manufacture approach of the optical recording medium of (7) characterized by establishing the re-exposure process which irradiates a radiation so that said light transmission layer may be in a semi-hardening condition with said light transmission layer formation process by using construction material of said light transmission layer as radiation-curing nature resin, re-irradiates a radiation after said slitting process at the light transmission layer of said semi-hardening condition, and is stiffened thoroughly.
[0026]
(9) A shaping means to fabricate the substrate of the shape of a disk type at least whose one side is an information recording surface, The light transmission layer means forming which forms a light transmission layer thinner than this substrate in said information recording surface, The manufacturing installation of the optical recording medium characterized by coming to contain a slitting means to form circular slitting in this light transmission layer, and a punching means to pierce some [at least] fields inside said slitting, to pierce by the tool, and to form a feed hole in said light transmission layer and said substrate.
[0027]
(10) The optical recording medium of (2) characterized by the amount of projection of said annular projection being larger than the thickness of said light transmission layer.
[0028]
In addition, the bore of the feed hole of a light transmission layer and the outer diameter of the punching tool which pierces a light transmission layer are not necessarily in agreement. For example, when forming slitting of a bigger diameter than the bore of the feed hole of a substrate like the above (5), the punching tool of an outer diameter equal to the inside of the feed hole which it is going to form in a substrate is used. A light transmission layer is pressurized by the punching tool, is pierced, and is divided by slitting of the direction outside of a path rather than the periphery of a tool. Rather than slitting, rather than a punching tool, the direction inside part of a path is pierced also including the part of the direction outside of a path, is further extruded in the thickness direction by the tool, and is removed from an optical recording medium. That is, the feed hole of a light transmission layer is formed with a bigger bore than the outer diameter of a punching tool. On the other hand, if slitting is formed for a diameter equal to the bore of the feed hole of a substrate, it will pierce with the bore of the feed hole of a light transmission layer, and the outer diameter of a tool will be in agreement.
[0029]
Moreover, although the vocabulary a "radiation" means electromagnetic waves, such as the gamma ray and X-ray which are generally emit with breaking of a radioactive element, and alpha rays, and a corpuscular ray, suppose that the vocabulary a "radiation" is use in a meaning call the generic name of the electromagnetic wave which has the property to stiffen the specific resin of a floating condition and corpuscular rays, such as ultraviolet rays and an electron ray, in this description.
[0030]
[Embodiment of the Invention]
Hereafter, the operation gestalt of this invention is explained to a detail with reference to a drawing.

[0031]
Drawing 1 is the sectional view of the optical recording medium 10 concerning this operation gestalt. Drawing 2 is the sectional view showing the punching process at the time of manufacture of an optical recording medium 10.
[0032]
The forming cycle by which the manufacture approach of an optical recording medium 10 fabricates the substrate 12 of the shape of a disk type whose one side is information recording surface 12A, The light transmission layer formation process which forms the light transmission layer 14 thinner than a substrate 12 in information recording surface 12A, It is characterized by coming to contain the slitting process which forms the circular slitting 16 in the light transmission layer 14, and the punching process which pierces the field inside slitting 16, pierces by the tool 18, and forms feed-hole 14A and a feed hole 20 in the light transmission layer 14 and a substrate 12.
[0033]
About other processes, since it is the same as that of the manufacture approach of the conventional optical recording medium, explanation is omitted suitably.
[0034]
First, the forming cycle of a substrate 12 is explained.
[0035]
Resin, such as a polycarbonate which heated beforehand and was fused between the molds (graphic display abbreviation) of a couple, is injected, and it fabricates in the shape of [it is cooled and kept warm, and a diameter does not have 120mm in information recording surface 12A, and a feed hole does not have / in the shape of / thickness in a predetermined molding temperature at 1.1mm] a disk type. Under the present circumstances, detailed predetermined irregularity etc. is formed in information recording surface 12A by La Stampa (graphic display abbreviation) (refer to drawing 3). (graphic display abbreviation) It may replace with a polycarbonate and resin, such as an acrylic and epoxy, may be used. In addition, sign 12B in drawing is the circular crevice fabricated to the field of information recording surface 12A and an opposite hand, in order to make a substrate 12 easy to pierce at the punching process mentioned later, and the bore is fabricated equally to the bore of a feed hole (it forms behind) 20. Thus, a substrate 12 is fabricated, and it removes from a mold, and cools in ordinary temperature, and the stratum functionale is formed in information recording surface 12A at degree process.
[0036]
Here, the formation process of the stratum functionale is explained briefly. In addition, since the stratum functionale is not considered to be the need rather than the light transmission layer 14 especially for grasp of this invention while it is a film further, the graphic display of the stratum functionale is omitted. When an optical recording medium 10 is a type only for playbacks, a reflecting layer is formed in information recording surface 12A as stratum functionale. On the other hand, when optical recording media 10 are record and a refreshable type about information, a reflecting layer and a record layer are formed in information recording surface 12A in this order as stratum functionale. A reflecting layer consists of aluminum, Ag, Au, etc., and is formed with the sputtering method, vacuum deposition, etc. A record layer consists of a phase change ingredient, a coloring matter ingredient, an optical magnetic adjuster, etc., and is formed with the sputtering method, a spin coat method, the ripping method, vacuum deposition, etc.
[0037]
Next, a light transmission layer formation process is explained.
[0038]
The light transmission layer 14 is formed on the stratum functionale with a spin coat method.
[0039]
First, a substrate 12 is arranged horizontally, revolution actuation is carried out, and as shown in drawing 4 , specified quantity supply of the resin 21 of ultraviolet-rays hardenability is carried out from the upper part in the core of a substrate 12. The centrifugal force which is proportional to distance from

the core of a substrate 12 acts on resin 21, and thereby, resin 21 is energized by the direction outside of a path, and is spread by the whole information recording surface 12A. Under the present circumstances, in order that a centrifugal force may hardly act on the resin 21 near the core, the core of a substrate 12 plays a role like ********, and carries out additional supply of the resin 21 continuously on information recording surface 12A. Thereby, as shown in the whole information recording surface 12A at drawing 5 , resin 21 is spread by uniform thickness. A light transmission layer formation process is completed by irradiating resin 21 and making it harden ultraviolet rays after spreading.

[0040]

Next, a slitting process is explained.

[0041]

First, cutting part 22A of a tool 22 is made to contact the position of the light transmission layer 14, as shown in drawing 6 . Cutting part 22A is made to specifically contact the location corresponding to the inner circumference of the feed hole 20 formed behind. If the light transmission layer 14 is rotated with a substrate 12 in this condition as shown in drawing 7 , the circular slitting 16 will be formed in the light transmission layer 14 in the shape of a said alignment. The depth of slitting 16 may be made shallower than the thickness of the light transmission layer 14, and may be made equal to the thickness of the light transmission layer 14. Moreover, it is made deeper than the thickness of the light transmission layer 14, and you may make it even a substrate 12 cut deeply.

[0042]

Next, a punching process is explained.

[0043]

First, the circular punching tool 18 of an outer diameter equal to the bore of the feed hole 20 which it is going to form is prepared, as shown in drawing 2 , it pierces, it pierces so that the periphery of a tool 18 may cut deeply and it may be in agreement with 16, and a tool 18 is made to counter the light transmission layer 14 in the shape of a said alignment. Next, the punching tool 18 is energized in the direction of this light transmission layer 14, and as the light transmission layer 14 and a substrate 12 are pierced, it pierces by the tool 18 and it is shown in drawing 1 , while forming feed-hole 14A in the light transmission layer 14, a feed hole 20 is formed in a substrate 12. In addition, feed-hole 14A and a feed hole 20 have an equal bore.

[0044]

Under the present circumstances, since it pierces in a light transmission layer, cut in it deeply in advance of a process, and slitting by the process is formed in it, and stress concentrates on the part of the slitting 16 of the light transmission layer 14, the light transmission layer 14 is cut deeply and it is divided into accuracy in the part of 16, weld flash does not occur in the inner circumference section of the light transmission layer 14, or the inner circumference section does not exfoliate from information recording surface 12A.

[0045]

An optical recording medium 10 is completed by the above. Since an optical recording medium 10 has the uniform thickness of the light transmission layer 14, while being able to record high-density information on accuracy and being able to reproduce, the inner circumference section sticks to information recording surface 12A certainly, and cannot exfoliate easily, and it is reliable.

[0046]

In addition, although feed-hole 14A of the feed hole 20 of a substrate 12 and the light transmission layer 14 is circular and it is formed in the optical recording medium 10 in the shape of a said alignment, naturally the eccentricity of the some from this circular and strict cardiac condition from which it separated a little from the strict perfect circle configuration is permitted that the precision of the perfect circle of feed holes 20 and 14A and the precision of this alignment should just be in the dimensional tolerance required of an optical recording medium.

[0047]

Next, the 2nd operation gestalt of this invention is explained.

[0048]

Drawing 8 is the sectional view showing the structure of the optical recording medium 30 concerning a **** 2 operation gestalt.

[0049]

The optical recording medium 30 is characterized by forming feed-hole 14A with a bigger bore than the feed hole 20 of a substrate 12 in the light transmission layer 14.

[0050]

Moreover, the manufacture approach of an optical recording medium 30 forms the slitting 16 of the light transmission layer 14 for a bigger diameter than the bore of the feed hole 20 of a substrate 12, as shown in drawing 9 . Pierce the field inside slitting 16, pressurize in the thickness direction by the tool 18, cut the light transmission layer 14 deeply, and it sets to 16. It is characterized by forming feed-hole 14A with a bigger bore than the feed hole 20 of a substrate 12 in the light transmission layer 14 by piercing the light transmission layer 14 and a substrate 12, dividing.

[0051]

About other points, since it is the same as that of the manufacture approach of said optical recording medium 10 and an optical recording medium 10, explanation is omitted suitably.

[0052]

First, a slitting process is explained.

[0053]

As shown in drawing 10 , rather than the location corresponding to the inner circumference of the feed hole 20 behind formed in a substrate 12, cutting part 22A of a tool 22 is made to contact the light transmission layer 14 a little in the location of the outside of the direction of a path, and the light transmission layer 14 is rotated with a substrate 12 in this condition. Thereby, the circular slitting 16 is formed in the light transmission layer 14 in the shape of a said alignment for a bigger diameter a little than the bore of the feed hole 20 behind formed in a substrate 12.

[0054]

Next, a punching process is explained.

[0055]

It pierces so that it may be in agreement with the inner circumference of the feed hole 20 which the periphery of the punching tool 18 tends to form in a substrate 12 first, and a tool 18 is made to counter the light transmission layer 14, as shown in drawing 9 . Next, the punching tool 18 is energized in the direction of the light transmission layer 14, and the feed hole 20 as pierced the light transmission layer 14 and a substrate 12, pierced by the tool 18 and shown in drawing 8 is formed in a substrate 12.

[0056]

Under the present circumstances, the punching tool 18 pressurizes the field inside the slitting 16 in the light transmission layer 14 at a substrate 12 side, cuts the light transmission layer 14 deeply, divides it in 16, and to a substrate 12 side, as it extrudes the inside part of slitting 16, it pierces it.

[0057]

In addition, although the diameter of the slitting 16 in the light transmission layer 14 is larger than the bore of the feed hole 20 of a substrate 12, it cuts deeply, and the inside part of 16 being extruded in the thickness direction by the punching tool 18, and forming the feed hole 20 of a substrate 12, this feed hole 20 is inserted in and it is removed. Moreover, crevice (roll off) 18A to which it can pierce to the cutting part peripheral face of a punching tool inside slitting, and the light transmission layer outside a tool (the shape of a ring) can enter into it is prepared, and you may enable it to remove the light transmission layer of the part concerned efficiently.

[0058]

Thereby, feed-hole 14A with a larger bore than the feed hole 20 of a substrate 12 is formed in the light transmission layer 14.

[0059]

In addition, since it pierces in a light transmission layer, cut in it deeply in advance of a process, and slitting by the process is formed in it also in this case, and stress concentrates on the part of the slitting 16 of the light transmission layer 14, the light transmission layer 14 is cut deeply and it is divided into

accuracy in the part of 16, weld flash does not occur in the inner circumference section of the light transmission layer 14, or the inner circumference section does not exfoliate from information recording surface 12A.

[0060]

Thus, by making feed-hole 14A of the light transmission layer 14 larger than the feed hole 20 of a substrate 12, even if it inserts a finger in a feed hole 20, it is hard coming to touch the inner circumference section of the light transmission layer 14 directly a finger, and exfoliation of the light transmission layer 14 by human handling can also be prevented.

[0061]

Similarly, when loading an information recording device, an information regenerative apparatus, etc. with an optical recording medium 30, exfoliation of the light transmission layer 14 at the time of the components for positioning etc. not contacting the inner circumference section of the light transmission layer 14, and using it with these equipments can also be prevented.

[0062]

Moreover, although there is a difference in the bore of the feed hole 20 of a substrate 12, and the bore of feed-hole 14A of the light transmission layer 14, two feed holes 20 and 14A can be formed by 1 time of punching by the punching tool 18 by forming slitting 16, and productive efficiency is good.

[0063]

In addition, naturally the eccentricity of the some from this circular and strict cardiac condition from which it separated a little from the strict perfect circle is permitted like said 1st operation gestalt that the precision of the perfect circle of the feed hole 20 of a substrate 12 and the precision of this alignment over an optical recording medium 30 should just be in the dimensional tolerance required of an optical recording medium 30.

[0064]

Moreover, that feed-hole 14A of the light transmission layer 14 should just be formed so that inner circumference may be located in the direction outside of a path rather than the feed hole 20 of a substrate 12, the precision of a perfect circle required of feed-hole 14A of the light transmission layer 14 and the precision of this alignment over an optical recording medium 30 need to be lower than the precision required of the feed hole 20 of a substrate 12, and do not necessarily need to be the feed hole 20 and this alignment of a substrate 12. That is, the precision required of formation of slitting 16 is low, and a slitting activity is so easy. Moreover, it is necessary to pierce in the case of punching and to cut deeply with a tool 18 that the punching tool 18 is deeply cut so that it may be in agreement with the feed hole 20 which it is going to form in a substrate 12, and it should just pierce the field inside 16, and 16 does not necessarily need to be in this cardiac condition.

[0065]

Next, the 3rd operation gestalt of this invention is explained.

[0066]

Drawing 11 is the sectional view showing the structure of the optical recording medium 40 concerning a **** 3 operation gestalt.

[0067]

The optical recording medium 40 is characterized by forming feed-hole 44A with a bigger bore than the outer diameter of the annular projection 48 in the light transmission layer 44 while the annular projection 48 which projects in the thickness direction is formed in the surroundings of the feed hole 50 of a substrate 42.

[0068]

As shown in drawing 12 , moreover, the manufacture approach of an optical recording medium 40 The circular projection 43 of a bigger outer diameter than the bore of the feed hole 50 of the substrate 42 behind formed by the forming cycle is fabricated to information recording surface 42A. Cut deeply in the light transmission layer 44 along the outside of the periphery of the circular projection 43, and 46 is formed. While forming the annular projection 48 in a substrate 42 around a feed hole 50 and a feed hole 50 by leaving the periphery section of the circular projection 43 by the punching tool 18, and piercing a

substrate 42, it is characterized by forming feed-hole 44A with a bigger bore than the outer diameter of this annular projection 48 in the light transmission layer 44.
[0069]
About other points, since it is the same as that of the manufacture approach of said optical recording media 10 and 30 and these optical recording media, explanation is omitted suitably.
[0070]
First, the forming cycle of a substrate 42 is explained.
[0071]
The circular projection 43 as shown in the information recording surface 42A side of a substrate 42 at drawing 13 is formed by establishing the circular crevice in the core of the mold which fabricates information recording surface 42A among the molds (graphic display abbreviation) of the couple which fabricates a substrate 42. The circular projection 43 is fabricated in the shape of a said alignment so that it may become a big outer diameter a little from the bore of the feed hole 50 formed behind. In addition, the thickness of parts other than circular projection 43 fabricates a substrate 42 so that 1.1mm and the amount of projection of the circular projection 43 may be set to 0.1mm. Moreover, the circular projection is prepared in the core of the mold which fabricates the field of information recording surface 42A of a substrate 42, and an opposite hand, and information recording surface 42A of a substrate 42 and crevice 42B circular to an opposite hand are fabricated in the shape of a said alignment. In addition, circular crevice 42B is fabricated so that a bore may become equal to the bore of the feed hole 50 formed behind.
[0072]
Next, the formation process of the light transmission layer 44 is explained.
[0073]
First, a substrate 42 is arranged horizontally, revolution actuation is carried out, and specified quantity supply of the ultraviolet-rays hardenability resin is carried out from the upper part in the core of this substrate 42. The centrifugal force which is proportional to distance from the core of a substrate 42 acts on the supplied resin, and it is energized by the direction outside of a path, and is spread by the whole information recording surface 42A. Under the present circumstances, in order that a centrifugal force may hardly act on the resin near the center of rotation, the core of a substrate 42 plays a role like ********, and carries out additional supply of the resin continuously on information recording surface 42A. Thereby, as shown in drawing 14 , resin is spread by the whole information recording surface 42A by uniform thickness. In addition, since resin is spread by uniform thickness also on the circular projection 43, the light transmission layer 44 is formed a ** with a stage. After spreading, irradiate resin, it is made to harden ultraviolet rays and the formation process of the light transmission layer 44 is completed.
[0074]
Next, a slitting process is explained.
[0075]
As shown in drawing 15 , slitting 46 is formed near the level difference part of the light transmission layer 44 so that the outside of the periphery of the circular projection 43 may be met. In addition, since it is the same as said 1st and 2nd operation gestalt about the tool which forms slitting 46, explanation is omitted.
[0076]
Next, a punching process is explained.
[0077]
First, it pierces so that it may be in agreement with the inner circumference of the feed hole 50 which the periphery of the punching tool 18 tends to form, and a tool 18 is made to counter the light transmission layer 44, as shown in drawing 12 . Next, the punching tool 18 is energized in the direction of the light transmission layer 44, it leaves the periphery section and the circular projection 43 is pierced, while forming the feed hole 50 as shown in drawing 11 , it leaves a part of circular projection 43, and the annular projection 48 is formed in the surroundings of a feed hole 50.

[0078]
Under the present circumstances, the punching tool 18 pressurizes in the thickness direction, cuts the light transmission layer 44 on the circular projection 43 deeply, divides it in 46, and it is pierced so that the inside part of slitting 46 may be extruded to a substrate 42 side. Thereby, feed-hole 44A with a bigger bore than the outer diameter of the annular projection 48 is formed in the light transmission layer 44.
[0079]
Since it pierces in a light transmission layer, cut in it deeply in advance of a process, and slitting by the process is formed in it also in this case, and stress concentrates on the part of the slitting 46 of the light transmission layer 44, the light transmission layer 44 is cut deeply and it is divided into accuracy in the part of 46, weld flash does not occur in the inner circumference section of the light transmission layer 44, or the inner circumference section does not exfoliate from information recording surface 42A.
[0080]
That is, like said optical recording media 10 and 30, the thickness of the light transmission layer 44 is uniform, the inner circumference section of the light transmission layer 44 sticks to information recording surface 42A certainly, and cannot exfoliate easily, and an optical recording medium 40 is reliable while it can record and reproduce information at accuracy.
[0081]
Furthermore, since the annular projection 48 is formed inside the inner circumference section of the light transmission layer 44, even if it inserts a finger in a feed hole 50, a finger cannot touch the inner circumference section of the light transmission layer 44 directly, and exfoliation of the light transmission layer 44 by human handling can also be prevented certainly.
[0082]
Similarly, when loading an information recording device, an information regenerative apparatus, etc. with an optical recording medium 40, exfoliation of the light transmission layer 44 at the time of the components for positioning etc. not contacting the inner circumference section of the light transmission layer 44, and using it with these equipments etc. can also be prevented certainly.
[0083]
That is, since the inner circumference section of the light transmission layer 44 is protected by the annular projection 48, exfoliation of the light transmission layer 44 can be prevented certainly.
[0084]
Moreover, although there is a difference in the bore of the feed hole 50 of a substrate 42, and the bore of feed-hole 44A of the light transmission layer 44, two feed holes 50 and 44A and the annular projection 48 can be formed by 1 time of punching by the punching tool 18 by forming slitting 46, and productive efficiency is good.
[0085]
In addition, the annular projection 48 does not necessarily need to have [that what is necessary is just to project in the thickness direction around the feed hole 50 of a substrate 42] the fixed width of face of the direction of a path. That is, the periphery of the annular projection 48 does not need to be the round shape of an optical recording medium 40 and this alignment. Therefore, in the forming cycle of a substrate 42, eccentricity of the circular projection 43 may be carried out a little, and you may form.
[0086]
Moreover, feed-hole 44A of the light transmission layer 44 does not need to be the round shape of an optical recording medium 40 and this alignment that what is necessary is to just be formed so that inner circumference may be located in the direction outside of a path rather than the annular projection 48. Therefore, slitting which was cut deeply and carried out eccentricity to the light transmission layer 44 a little also at the process may be formed.
[0087]
Moreover, in said the 1st - 3rd operation gestalt, although the optical recording medium is considered as the one side type which can record information only on one side, this invention is not limited to this and, naturally this invention can be applied also to the optical recording medium of the double-sided type

which can record information on both sides. In this case, thickness can consider as the optical recording medium which is 1.2mm by setting thickness of a substrate to 1.0mm and carrying out the laminating of the 0.1mm light transmission layer to both sides of a substrate. Or thickness prepares two things which carried out the laminating of the light transmission layer which is 0.1mm, and may stick substrate sides on the substrate whose thickness is 0.5mm. Furthermore, two or more record layers can apply this invention also to the optical recording medium formed in one side or both sides.

[0088]

Moreover, although it cuts deeply in the light transmission layers 14 and 44 and 16 and 46 are formed after irradiating ultraviolet rays to the resin spread with the formation process of the light transmission layers 14 and 44 in said the 1st - 3rd operation gestalt and making it harden thoroughly This invention makes the spread resin a semi-hardening condition, and after it forms slitting 16 and 46, you may make it stiffen thoroughly the resin which re-irradiated ultraviolet rays and spread them by not being limited to to this and controlling the irradiation time of ultraviolet rays etc. by the formation process of the light transmission layers 14 and 44 suitably.

[0089]

When making a cutting edge contact the light transmission layers 14 and 44, cutting deeply and forming 16 and 46, although it can extend a little in the thickness direction of a cutting edge, if the light transmission layers 14 and 44 are in a semi-hardening condition, easily, it can follow, and the light transmission layers 14 and 44 can deform in the thickness direction of a cutting edge, and can prevent the exfoliation from substrates 12 and 42 certainly.

[0090]

As for the degree of the semi-hardening of the spread resin, it is desirable that it is the hardness which is extent with which resin does not adhere to a cutting edge, and is the softness which is extent which slitting of a cutting edge is followed, and resin follows and deforms in the thickness direction of a cutting edge easily, and does not exfoliate from an interface with a substrate.

[0091]

In addition, in order to pierce certainly the inside part of slitting in a light transmission layer and to remove it, it is desirable to pierce and to stiffen a light transmission layer thoroughly before a process.

[0092]

Moreover, in said the 1st - 3rd operation gestalt, although a light transmission layer is resin of ultraviolet-rays hardenability, it may use the resin of the property hardened with the radiation of other classes, such as resin of electron ray hardenability.

[0093]

Moreover, in said the 1st - 3rd operation gestalt, although the light transmission layer is formed in a substrate with the spin coat method, this invention is not limited to this and may form a light transmission layer in a substrate by sticking the sheet-like ingredient of light transmission nature on a substrate for example. Furthermore, a light transmission layer may be formed in a substrate by other approaches, such as a doctor blade method.

[0094]

Moreover, in said the 1st - 3rd operation gestalt, slitting may be formed in a light transmission layer by making a tool contact a light transmission layer, not limiting this invention to this, fixing a substrate and a light transmission layer, and moving a tool in a circular orbit, although slitting is formed by rotating a light transmission layer with a substrate. Moreover, it may replace with a tool and slitting may be formed using a laser beam. Moreover, as shown, for example in drawing 16 , the pressure welding of the edge of the cylindrical tool 60 may be carried out to a light transmission layer, and slitting 16 (46) may be formed.

[0095]

Moreover, although an optical recording medium is pierced, it pierces from a light transmission layer side to a substrate side by the tool in a punching process in said the 1st - 3rd operation gestalt and the feed hole is formed This invention is not what is limited to this. When the depth of slitting is enough etc., When the force of a direction of exfoliating from the information recording surface which acts on a

light transmission layer by punching is small, as shown in drawing 17 , an optical recording medium may be pierced from a substrate 12 (42) side to the light transmission layer 14 (44) side, it may pierce by the tool, and a feed hole may be formed. When the force of a direction of on the other hand exfoliating from the information recording surface which acts on a light transmission layer by punching when slitting is shallow is large, it is desirable to pierce an optical recording medium from a light transmission layer side to a substrate side, to pierce by the tool like said the 1st - 3rd operation gestalt, and to form a feed hole.

[0096]

Moreover, although the circular crevices 12B and 42B are fabricated by the forming cycle, substrates 12 and 42 are not limited to this, and this invention fabricates a substrate in the shape of [without a circular crevice] a disk type, and you may make it pierce it in said the 1st - 3rd operation gestalt, when punching of substrates 12 and 42 is easy.

[0097]

Moreover, in said 3rd operation gestalt, although the amount of projection of the annular projection 48 is 0.1mm equal to the thickness of the light transmission layer 44, this invention is not limited to this and may make the amount of projection of the annular projection 44 larger than the thickness of the light transmission layer 44. By doing in this way, when it is [optical recording medium / 40] sufficient in two or more [-fold] and lays an optical recording medium 40 in base superiors, the light transmission layer 44 can prevent contacting other optical recording media, a base, etc., and can protect the light transmission layer 44. In addition, although the light transmission layer 44 can contact other optical recording media etc. if an optical recording medium 40 inclines a little, contact pressure can be mitigated also in this case and the fixed effectiveness of protecting the light transmission layer 44 can be expected.

[0098]

In addition, also when the amount of projection of the annular projection 44 is smaller than the thickness of the light transmission layer 44, the fixed effectiveness that the annular projection 44 protects the inner circumference section of the light transmission layer 44 from a finger, positioning components, etc. is acquired.

[0099]

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The sectional view showing the structure of the optical recording medium concerning the 1st operation gestalt of this invention
[Drawing 2] The sectional view showing the punching process of this optical recording medium
[Drawing 3] The sectional view showing the forming cycle of the substrate of this optical recording medium
[Drawing 4] The sectional view showing spreading of the resin in the formation process of the optical recording layer of this optical recording medium
[Drawing 5] The sectional view showing the optical recording layer formed of the homeoplasia process
[Drawing 6] The sectional view showing the slitting process of this optical recording medium
[Drawing 7] This perspective view
[Drawing 8] The sectional view showing the structure of the optical recording medium concerning the 2nd operation gestalt of this invention
[Drawing 9] The sectional view showing the punching process of this optical recording medium
[Drawing 10] The sectional view showing the slitting process of this optical recording medium
[Drawing 11] The sectional view showing the structure of the optical recording medium concerning the 3rd operation gestalt of this invention
[Drawing 12] The sectional view showing the punching process of this optical recording medium
[Drawing 13] The sectional view showing the forming cycle of the substrate of this optical recording medium
[Drawing 14] The sectional view showing the formation process of the optical recording layer of this optical recording medium
[Drawing 15] The sectional view showing the slitting process of this optical recording medium
[Drawing 16] The sectional view showing the slitting process concerning other operation gestalten of this invention
[Drawing 17] The sectional view showing the punching process concerning other operation gestalten of this invention
[Drawing 18] The perspective view showing the structure of the conventional optical recording medium
[Drawing 19] The sectional view showing the punching process of this optical recording medium
[Drawing 20] The sectional view showing the weld flash of the inner circumference section of the light transmission layer by this punching process
[Description of Notations]
10, 30, 40,100 -- Optical recording medium
12 42,102 -- Substrate
12A, 42A, 102A -- Information recording surface
14 44,104 -- Light transmission layer
16 46 -- Slitting
18 -- Punching tool

14A, 20, 44A, 50 -- Feed hole
43 -- Circular projection
48 -- Annular projection

[Translation done.]

* NOTICES *

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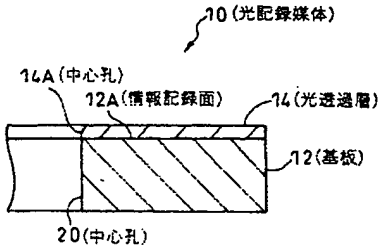
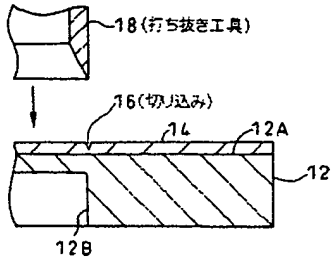
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

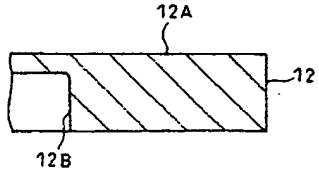
[Drawing 1]



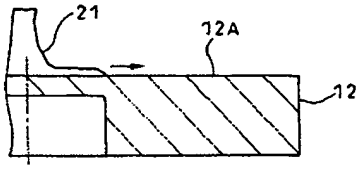
[Drawing 2]



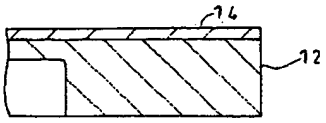
[Drawing 3]



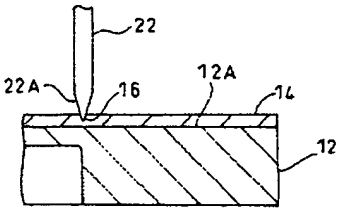
[Drawing 4]



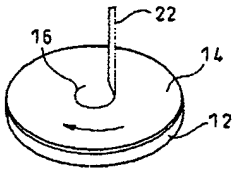
[Drawing 5]



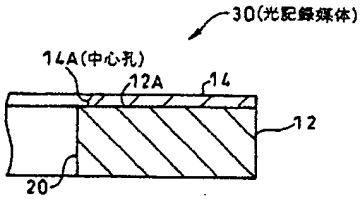
[Drawing 6]



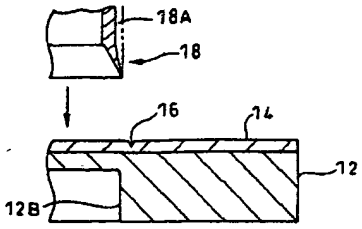
[Drawing 7]



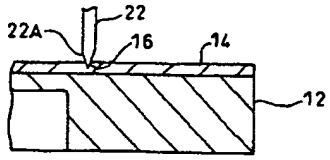
[Drawing 8]



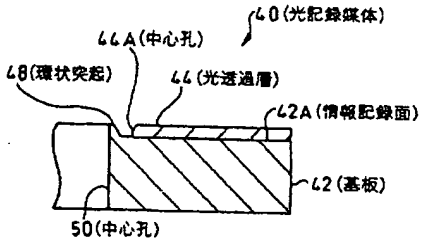
[Drawing 9]



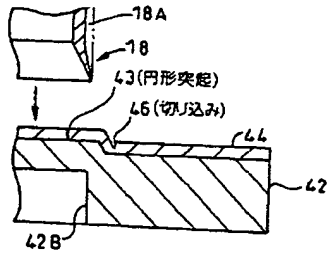
[Drawing 10]



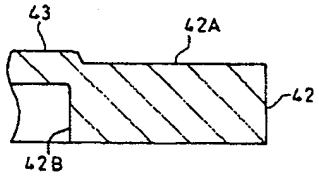
[Drawing 11]



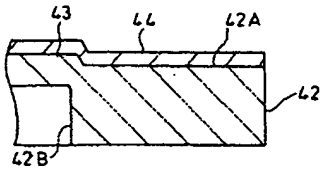
[Drawing 12]



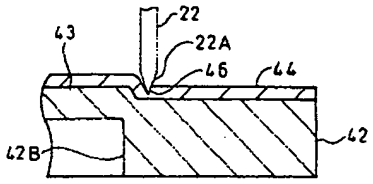
[Drawing 13]



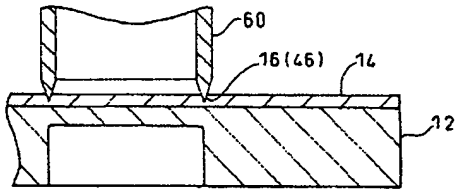
[Drawing 14]



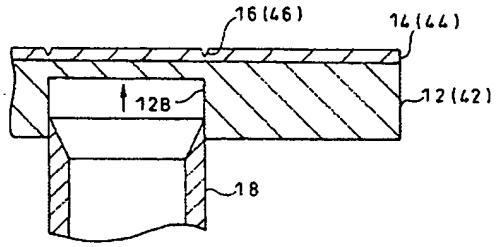
[Drawing 15]



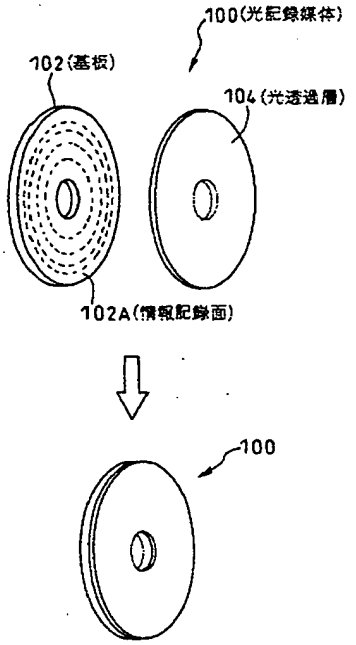
[Drawing 16]



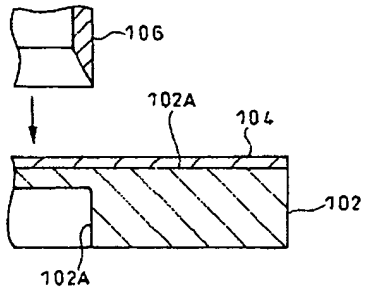
[Drawing 17]



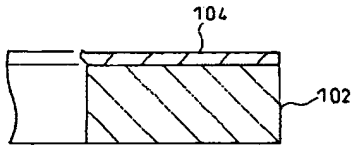
[Drawing 18]



[Drawing 19]



[Drawing 20]



[Translation done.]